

MORTALITY
OF
SHEFFIELD.

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AN

ENQUIRY INTO THE CAUSES

OF THE

MORTALITY OF SHEFFIELD.


BY

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An Enquiry into the Causes of the Mortality of Sheffield.

IN presenting this pamphlet to the public of Sheffield, I am conscious of its many shortcomings,—deficiencies in part owing to the small amount of leisure at a medical man's disposal whilst engaged in the practice of his profession; and deficiencies also which could only be remedied by the possession by me of a greater knowledge of the town than I can have acquired during the few years in which I have had opportunities of making sanitary observations in it, and of noting those causes which rule its tables of mortality.

Then why not wait, says the reader, until you have a more complete experience? My apology must be that by now sketching out some of the statistics of death, and bringing the conclusions and deductions arising from them to the notice of the public, and to that of the medical profession practising in Sheffield, in some years' time I shall be able to arrive at more valuable inferences than I should if I were to neglect the publication of these results until then; for at a future period I hope to fall back upon the experience of others, which they may perhaps be induced to acquire through the perusal of this unpretending volume.

The value of sanitary knowledge is never so highly esteemed as when some pestilence is stalking in our midst and decimating our population. The report of cholera coming, promptly induces us to put our houses in order, and vaccination is never in such good repute as when small-pox is a guest. But unfortunately when the danger is not so imminent, we soon grow careless and apathetic of the action of those laws on which the public health depends so largely. When small-pox was raging in Sheffield the public cried out loudly for small-pox hospitals, but soon the cry began to decline and die, and I opine its resurrection will not

ensue until the want of Fever Hospital accommodation is again forced upon our notice by another visit of this or some other equally fatal epidemic.

But some people even deny the worth of sanitary science altogether: with a portion of this class it would be useless to argue, for they have very little belief in anything except—themselves; but to such as are amenable to reason, I would submit the following instances of the value of sanitary science—hygiene and preventive medicine as it is variously termed,—viz., the obliteration of the plague which depopulated our towns and villages some centuries ago; of sea-scurvy, a disease which destroyed more of our sailors some years ago than every other sickness, the casualties of the ocean, and the efforts of our enemies all combined. Some years since the average duration of life in Wiltshire was 33, whilst it was only 17 in Manchester, but now, owing to the improved sanitary conditions effected by the various Town Councils, the urban and rural ages are nearly equal: but there is still room for vast improvement both in our cities and villages. Then, again, take the case of Liverpool; in the year 1846, 38 persons out of every thousand died, but last year its mortality was not quite 28, and in 1864 it was only 24, and this chiefly through the closing of cellar dwellings, improved sewerage, and the separation of contagious cases; thus in 1864, 14 lives a year were saved out of every thousand of the population, and when we remember the number of thousands 14 has to be multiplied by to see how many lives were saved, I think I need not say any more respecting the worth and utility of sanitary research.

No doubt the conclusions arrived at on sanitary matters are frequently erroneous. Hygiene is comparatively a new science, and these errors arise from our inexperience and from jumping at conclusions too hastily, and ignoring the great fact that there is not one cause operating alone, but many others, and their actions also must be estimated before reliable inferences can be drawn; thus, the opponents of a constant water supply would point with delight to a year not remarkable for a high mortality, when there has been a scarcity of water, and persons opposed to

drainage point to well-drained towns who sometimes have as large a mortality as have those who neglect such vital means of disease-prevention, ignoring altogether the question as to how far these same sewers are made a *cause* of disease by inefficient trapping. But the mouths of these objectors to hygiene were most effectively closed by Dr. Buchanan some years ago. He enquired into the total death-rate from all causes and from some particular diseases in twenty-five towns both before and after sanitary improvements. The general result was to shew that these sanitary improvements had resulted in a lowering of the death-rate in 19 of the 25 towns,—the reduction averaging ten per centum in each, and in 21 towns the reduction in typhoid fever mortality was 45·4 per cent. ; in 3 cases where there was no reduction in the number of typhoid deaths, he found the sewerage arrangements were badly contrived, and he concludes his remarks by saying, “that these three cases afford an excellent instance of the unfavourable consequences of badly-arranged sewers.” In future pages I shall have to point out how the mortality-rates are frequently influenced by more causes than one, so I will defer the farther consideration of this subject until then.

The Public Health Act 1872 is no doubt a valuable measure, and one in the right direction, but like all other good measures it will require the intelligent co-operation of the units of the nation in order to make it an efficient one. It has been forcibly said that you cannot make a man sober by act of parliament, but you may frequently educate him to be sober : in like manner you cannot make a man healthy by act of parliament, but you can make both him and communities healthy by teaching them those laws on which health depends ; and until the public can be made to understand that by observing certain simple rules, they may thereby prolong their lives very considerably, the efforts of the sanitary authorities will be comparatively futile. Much good would ensue from popular lectures on the subject, a plan which has met with the hearty support of the masses in London, Manchester, &c. For if the public were properly educated in the

simple laws of life several results would ensue which would greatly tend to diminish our unnecessary expenditure of human life by improving the general *physique* of the people, and so make them better able to withstand disease; thus did improved relations exist between master and servant, between landlord and tenant, between husbands and wives, and children and parents, and were more care exercised in the formation of provident marriages, and in the rearing of offspring, by proper attention being paid to their food, clothing, cleanliness, and choice of occupation, they would, when matured, be much more prepared to resist disease. Many people never seem to consider that the skin has to perform a goodly part in the processes of respiration, excretion, etc., but allow its millions of pores to be blocked up with dirt from year's end to year's end. Public Baths will tend to check such malpractices. Then again, since the more common use of flannel bronchial complaints have very much diminished. Boerharve was in the right when he said: "You should take off your winter clothing at the end of midsummer's-day only to put it on again next morning." In the matter of eating, people take that which they like, rather than that which is good for them, and the wives of our artizans are in a state of gross ignorance in regard to the most simple culinary operations. This may appear of very little consequence, but wait until sickness comes, and then this lack of knowledge on their part is felt by the medical man, who scores of times sees a patient lost whose life might have been saved if the housewife, instead of having spent her youth in a warehouse, had learnt the rudiments of cookery as a domestic servant. When treating of the Infant Mortality, I shall again have to refer to the influence of diet on the death-rate.

ZYMOTIC OR INFECTIOUS DISEASES.

In this group are included small-pox, measles, scarlet-fever, diptheria, whooping-cough, fever, and diarrhœa. The reason they are termed zymotic is because it is believed that they can only be propagated by the action of 'fermenting germs'; each disease having a distinct germ of its own. As in the vegetable

world the germ of the oak produces only the oak, and without the germ there can be no oak, so without small-pox germs we can have no small-pox, nor can the small-pox germ light up scarlet fever. I will carry the parallel between the vegetable and the disease germs yet another step : both are alike destroyed by the extremes of heat or cold, and too much air, and both shun sunlight, and require appropriate soils upon which to flourish. We sometimes hear people say that small-pox, etc., are the results of dirty habits, and in a sense no doubt they are right, for filth is an excellent *hot-bed* for disease, but all the filth in the world would not create the disease if the germ were not there previously, any more than cucumbers would grow without seed just because a frame was made suitable for them. I have been explanatory on this head more particularly because I wish to impress upon my readers the axiom that, if the disease germs can be destroyed, by disinfectants, by fresh air and plenty of it, and by starving them through the cultivation of cleanly habits, we may hope materially to diminish the mortality from this class of diseases. During each of the years from 1862 to 1872 inclusive, the mortality from these diseases in Sheffield has been 7·4 persons every year for every thousand of the population, thus—1500 persons die every year from diseases which it is as possible to stamp out as was the rinderpest. But it may be said these diseases are consequent upon our civilization, and condensation of population ; no doubt they are, but they can still be controlled by efficient sanitary and hygienic regulations.

The excessive Mortality of Sheffield. A question which has often suggested itself to my mind is this : Has Sheffield a greater loss from zymotic disease than have London and the other large English towns ; and what proportion do its general rates of mortality bear to those towns ? After considerable labour and research I am enabled to show at a glance, through a table I have drawn up, and which I now subjoin, that both its 'general' and its 'zymotic' mortality are greater than that of London and the average of the 17 large English towns enumerated in the Regis-

trar-General's weekly tables of mortality, in proportion to population. My calculations extend over the period of the last three years, for it is necessary to take more than one year in order to arrive at reliable conclusions, and further, I fix upon these three years because, during the time the mortality has been occurring, I have been closely watching and investigating the local action of those causes which have resulted in this excessive loss of human life.

TABLE I. *Shows the General Mortality and the Mortality from Zymotic Diseases for each 1000 of the Population per annum in Sheffield, as compared with London and 17 of our largest Towns, during each of the quarters of the years 1870-71-72.*

	Annual Mortality per Thousand from all causes.			Annual Mortality from Zymotic Diseases per Thousand.			Proportion of Deaths from Zymotic Dis- eases to Deaths from all causes.		
	Shef- field	Lon- don	17 Towns	Shef- field	Lon- don	17 Towns	Shef- field	Lon- don	17 Towns
Quarterending									
March, 1870...	28'3	26'7	27'1	6'9	4'1	4'3	24'5	15'2	15'7
June, 1870...	22'0	22'0	22'0	4'8	4'0	3'8	21'5	18'1	16'9
Sept., 1870...	28'0	23'0	26'0	10'9	7'3	8'5	39'8	31'1	33'2
Dec., 1870...	22'9	24'1	25'3	4'8	5'2	5'6	21'0	21'4	21'1
Average of the 4 Quarters...	25'3	23'9	25'1	6'8	5'1	5'5	26'7	21'4	21'9
Quarterending									
March, 1871...	25'2	27'0	27'8	3'8	5'8	5'6	14'9	21'4	20'1
June, 1871...	25'1	23'1	24'4	4'5	6'2	5'9	17'8	26'8	24'3
Sept., 1871...	30'1	22'9	26'0	11'5	7'1	8'8	38'0	31'0	33'7
Dec., 1871...	31'8	25'8	27'4	10'8	4'9	5'9	34'0	18'8	21'4
Average of the 4 Quarters...	28'0	24'7	26'2	7'6	6'0	6'5	26'1	24'5	24'8
Quarterending									
March, 1872...	29'8	24'0	25'7	10'3	4'5	5'1	34'4	18'9	19'8
June, 1872...	24'2	20'7	22'5	4'4	3'6	3'9	18'1	17'4	17'3
Sept., 1872...	26'5	21'4	24'2	8'9	5'3	7'0	33'4	24'9	28'8
Dec., 1872...	23'8	19'8	22'6	4'5	1'9	3'4	18'8	9'7	15'1
Average of the 4 Quarters...	26'0	21'4	23'7	7'0	3'8	4'8	26'1	17'7	20'2
Mean of the 3 Years	26'4	23'3	25'0	7'1	4'9	5'6	26'3	21'3	22'3

It must now be my task to explain of what diseases this excessive mortality is made up ; to account for it ; and finally offer some suggestions to avoid its recurrence. Our excess is caused in part by the peculiar trades of the town, of which I shall treat further on and separately ; but in a greater measure the excess is dependent upon diseases of the ' zymotic ' class prevailing so extensively in our midst.

TABLE II. *Shows the number of Deaths in Sheffield from each of the principal Zymotic Diseases in each quarter of the years 1870-71-72.*

1870.							
Quarter ending	Small Pox	Measles	Scarlet Fever	Diptheria	Whooping Cough	Fever	Diarrhoea
March...	2	27	269	7	36	66	21
June ...	2	12	161	4	30	52	37
Sept. ...	1	10	113	7	24	111	409
Dec. ...	2	11	114	8	12	111	40
Totals in							
1870...	7	60	657	26	102	340	507
1871.							
March...	3	15	71	6	54	67	22
June ...	6	58	85	4	43	46	28
Sept. ...	37	40	81	4	42	45	440
Dec. ...	360	48	85	2	37	63	57
Totals in							
1871...	406	161	322	16	176	221	547
1872.							
March...	430	25	78	9	33	39	19
June ...	123	29	31	6	38	33	11
Sept. ...	37	20	34	3	47	43	363
Dec. ...	11	3	46	0	12	35	79
Totals in							
1872...	601	77	189	18	130	150	472
Average of 3 years 1870 to 1872 ...	339	72	389	20	136	237	508
Average of 9 years 1862 to 1870 ...	133	124	328	40	144	266	364

By the foregoing table, the figures of which are very important, we learn that in 1870, scarlet fever, diarrhœa, and fever were our greatest enemies; in 1871, diarrhœa, small-pox, scarlet fever, and fever; and in 1872, small-pox and diarrhœa.

Causes and Prevention of Scarlet Fever Mortality. The great fatality from this disease is in a major degree due to the carelessness of parents. 1st. By allowing those who have had the disease to mix among other children at the very time when they are most capable of conveying the infection; thus, a child has scarlet fever, and two or three weeks afterwards it is sent to school, whilst its skin is yet 'peeling,' and as this is a most infectious period it readily conveys the disease germs to its school-fellows, who again infect their brothers and sisters at home. 2nd. The apathetic manner in which the parents view the disease; if it is at all mild in its mode of attack the child is allowed to run about, takes cold, then follows dropsy, and frequently death; this fatal result being caused entirely through the ignorance and carelessness of the parent. The disinfection of scarlet fever clothing is most important, for mere washing or pouring boiling water over them will not suffice; to disinfect with water the clothes should be boiled for an hour at least; another plan is to immerse them in a weak solution of chloride of lime, or to place them in a moderately-heated oven for a short time; but no process equals that in point of convenience which is employed by the Health Committee by means of their patent disinfecting apparatus, for it does not injure the material in the least. I have said that simply washing the clothes does not disinfect them; how largely then must disease be disseminated by the custom of mangling them at a machine common to scores of families, and then allowing other persons' clothes to be brought into contact with the infected machine. Many of the children of the better classes, who, perhaps, have not recently mixed with other children, have scarlet fever, and the parents are puzzled to know how they can have 'caught' it, never thinking for a moment that the family linen has been mixed with infected linen at the

laundry, when the washing is put out. Then again, coinage is a great power in spreading contagion. How common a thing it is to give a sick child a coin in order to quiet it. To quote an extreme case :—Last year I was attending the child of a shop-keeper, which was suffering from small-pox ; the patient was most loathsome to look on, but as soon as it could sit up in bed they gave it a heap of copper coins to amuse itself with ; had I not happened to have observed the circumstance, the whole neighbourhood would have had an opportunity of unwittingly testing the value of vaccination.

Deaths from Fever and Diarrhœa ; their Causes and Prevention. I shall treat of these two diseases together, as their modes of origin, propagation, and extinction are very similar in many respects.

The Deaths from Diarrhœa in Sheffield were 507, 547, and 472 in the years 1870, 1871, and 1872 respectively. The average number of deaths from diarrhœa from 1861 to 1870 was 364 per annum ; so here we have a distinct increase, by referring to Table II., page 9, it is seen that the number of diarrhœa deaths always makes a sudden leap in the third quarter of the year, and this is the case every year. In this third quarter the annual death-rate from diarrhœa alone may be thus expressed for Sheffield, London, and the large towns in the years 1870, 1871, and 1872 :

TABLE III.

	Sheffield.	London.	Large English Towns.	} For every 1000 of the Popula- tion per annum.
1870.....	7·0	3·5	4·9	
1871.....	7·3	3·8	5·1	
1872.....	5·9	3·5	4·4	
Mean of the 3 years...	6·7	3·6	4·4	

By these figures we see that in these three years Sheffield lost nearly as many again as did London, and half as many again as the other large English towns. Table II. also shows that the actual numbers who died in Sheffield from diarrhœa in the Sep-

tember quarter of 1870, 1871, and 1872 were 409, 440, and 363 for the three years respectively. I need offer no apology for bringing these figures under your notice. Take the year 1870 for instance : above 200 lives were lost in Sheffield from diarrhoea which would have been saved had they lived in London.

The Deaths from Fever in Sheffield from 1861 to 1873 have been 250 annually, and during the years 1870, 1871, and 1872, 340, 221, and 150 respectively. During these three years the loss has been distributed amongst the various registration sub-districts (which make up the Borough), for each 10,000 of the population of those districts, in the following manner, arranged according to their demerits :—Attercliffe, 23·22 ; Sheffield North (*including Workhouse deaths*), 19·90 ; Sheffield West, 16·94 ; Brightside, 16·77 ; Park, 12·27 ; Ecclesall Bierlow (*including Workhouse*), 10·83 ; Nether Hallam, 10·59 ; Sheffield South, 7·72 ; Upper Hallam, 7·55. But in comparing the fever mortality of these districts, it must be borne in mind that Ecclesall Bierlow and Sheffield North are credited with more than belong to them legitimately, as a great number of fever patients have been removed from other districts to their respective workhouses. I may also remark that the great excess which Attercliffe and Brightside show is in a great measure due to their close proximity to the river after it has received large quantities of sewage from the town. Those districts which stand high appear to claim our consideration from the relative magnitude of their fever-rate, viz., Sheffield West, The Park, and Nether Hallam (which includes Heeley) ; their elevated position exposes them more to the noxious vapours from the sewers, which I shew at page 16 always tend to ascend. Upper Hallam cannot fairly be compared with our other townships ; it has more of the characteristics of a rural district than an urban one.

As we compared the mortality from diarrhoea in Sheffield with that prevailing in London and the other large English towns, we will also give a similar table of the fever mortality during the quarter ending September in the same three years, but as the

numbers are comparatively small, I shall carry the fraction a decimal point farther in order to arrive at correct conclusions.

TABLE IV. *Shows the Mortality from Fever in Sheffield as contrasted with that which prevailed in London and the large Towns during the September Quarters of the years 1870, 1871, 1872.*

	Sheffield.	London.	Large English Towns.	Per 1000 of Population per Annum.
1870.....	1'79	'67	2'15	
1871.....	'72	'45	1'48	
1872.....	'69	'38	1'29	
Mean of the 3 years...	1'06	'50	1'64	

Once more we show that Sheffield loses as many again from fever as does London, but it compares favourably in this case with the other large towns; which is at the best but a very sorry consolation, for if London can control the development of typhus and typhoid, Sheffield ought to be able, for at page 5, I showed that to lessen the mortality from this cause it was only requisite to use plenty of water and see that our sewage system was good.

Causes and Prevention of the Mortality from Diarrhœa and Fever. The size of the diarrhœa death-rate is mainly dependent upon the quality and kind of food; a constant and pure water-supply; the perfection of the sewage system, including the efficiency of the trapping arrangements; the use of disinfectants; adequate scavenging; overcrowding, and certain atmospheric conditions, such as temperature and electricity. The fever death-rate is dependent upon a constant water-supply, the efficient trapping and ventilation of sewers, the use of disinfectants, upon overcrowding, and the utilization of sewage.

It will be more convenient to treat of the action of these causes farther on, under the chapters headed,—*Infant Mortality*, and *Constant Water-Supply*, with the exception of the *Influences of Temperature*, and of the *proper Ventilation of Sewers*.

When the mean temperature is 4 or 5 degrees above 59·9 F., we have an excessive diarrhœa mortality, but if the mean does not fluctuate between 63 and 65, the temperature does not appear to be of much consequence, if a large number of years be compared together. If the reader will refer to Table V. below, he will see that although our mean temperatures were unfavourable to the development of diarrhœa, yet we were most terribly scourged by it.

TABLE V.

	Deaths for each 1000 of the Population from Diarrhœa in Quarter ending	Mean Temperature of the Months of		
	September	July	August	September
1870	7·0	58·8	60·8	59·0
1871	7·3	57·9	61·4	58·2
1872	5·9	59·2	61·3	58·8

Ventilation of Sewers. London pays more attention to this question than does any other town, and we have seen that it is most amply repaid, by the comparatively insignificant number it loses from diarrhœa and fever.

In the autumn of 1870 I called attention to this question in the columns of the *Sheffield Daily Telegraph*, in the subjoined letter, which appeared on October 21st :—

CAUSES OF FEVER IN SHEFFIELD.

“TO THE EDITOR OF THE SHEFFIELD DAILY TELEGRAPH,

SIR,—If any theorist, in riding his hobby, seeks to fix upon one cause as the origin of fever, he must strain some facts and ignore others in order that his idea may secure attention. Were I asked to name the most striking reason, I should undoubtedly instance the imperfect flushing of the sewers, as I did some months ago in a letter to the *Telegraph*, in which I pointed out the results which must ensue if a diminished supply of water was only afforded to the sewage system. Doubtless also habits of uncleanness, (not merely personal,) the composition of the ground in which the houses are sunk, the relative altitudes of different portions of the town, and overcrowding, each add their quota; but in addition to these causes allow me to bring under the notice of your readers; one which very frequently gives rise to the disease in question in the homes of our artisans, viz., an imperfectly or totally untrapped sinkstone. It is well-known this domestic con-

venience is generally in that room which the residents most occupy, and that the stench which pervades the house at certain times is something indescribable, and to make matters worse the water tap is not placed over this 'fever-manufactory,' but outside in the adjoining premises. Of course a quantity of water poured down the conduct pipe would mitigate this evil, but as that process would require labour, it is seldom resorted to. You may say that this cause is all theoretical; perhaps so, but I have so often seen the noisome sinkstone and our pestilential visitor in close companionship, that I have set them down as workers together in evil. Cannot this nuisance be remedied?

"Before concluding this letter, allow me to suggest that as our drains cannot be perfectly flushed, they be *ventilated* instead, either by building tall brick-work shafts in high situations, which by the aid of fires might be made to act in the same way as those used to purify the air in coal mines. Or if the town should think the working of these would be too costly, let openings be made in the sewers at convenient distances, (so contrived as not to receive road washings,) and trays containing finely powdered animal charcoal, be suspended between the sewage and the orifice, over which trays the foul air must pass ere it reaches the external atmosphere. The carbon thus disposed would absorb many thousand times its volume of the noxious gases, and would only require to be simply heated in order to re-commence its good sanitary work. This plan is found in practice to be both economical and effective.

"I am, Sir,

"Yours truly,

"JOHN TAYLOR, SURGEON."

Although we pour our excreta into sewers, we have only partially done our duty until we have seen that our houses are not in direct contact with sewage air, either by efficient trapping or what is better, to let the waste water from the sinkstone run for a short distance in an *un-enclosed* channel, so that when the sewage air *backs up*, it does not enter the kitchen, as it does if the trap is not perfectly efficient. We cannot too much bear in mind that sewers are underground cesspools. Now the sewage air is lighter than the outside air, especially in the night, for their air has its temperature raised by the quantities of warm water and steam which are poured into them; from actual experiments which I made last year I found that the temperature of the air in the sewers was 60° Fah., whilst the air in a house at the same time of night was 40·0 F. Now both the sewage air and the

house air may practically be considered to be saturated with moisture for those temperatures, and the air in the sewer would thus only weigh 532·84 grains, whilst that in the house would weigh 556·03 grains ; thus as the sewage is 23·19 grains lighter than the other, it is readily seen that the sewage air must necessarily ascend into the house if its course is uninterrupted. In theory, all things being equal, we ought to have more fever in the higher parts of the town ; and further, as the difference in the weights of the external and sewage air is greater in winter than in summer, (all things still being equal,) we ought to have a greater fever mortality in the colder months : this I find to be actually the case. I am unaware that the above explanation of the great *winter* fever mortality of our large towns has been previously advanced by anyone, so I will merely offer it as a suggestion, to be thought over, and looked at from other points of view, in order that there may be no ground of fallacy.



INFANT MORTALITY.

The subject of Infant Mortality is one demanding the attention of every one anxious to lessen the death-rate in our large towns. I have previously shown that a portion of the excessive death-rate of Sheffield was due to the enormous numbers we lost from "zymotic diseases;" now, it will be my next duty to point out that we lose more infants under one year of age than do London and the other large towns. And I shall again use the three last years' returns of the numbers of deaths, etc., as my bases of calculation.

During the years 1870, 1871, and 1872, the percentage of infantile deaths to deaths from all causes was—Sheffield, 28·1; London, 24·8; large English towns, 26·7. The manner in which children are killed off in Sheffield is something fearful to contemplate. By taking a number of years together I find that 27·22 of the total number of children born, died before they reached the age of one; and *that above 50 per cent. of the children born in Sheffield never attain the age of 5.* These figures are very startling.

That this infant mortality depends upon causes which are preventible is evident not only from the different proportions of deaths which occur in Sheffield as compared with London and the other large towns, but also from the different proportions which regularly prevail in the different townships of Sheffield.

TABLE VI. *Shows the Infantile Death-rate, etc., prevailing in the various Townships of Sheffield in 1870, 1871, and 1872, and the Number of Houses to an Acre in each.*

	No. of Houses to an acre.	Percentage of deaths under 1 to deaths from all causes in 1870-71-72. Mean of the 3 years.	Birth-rate per 1000 of Population. Mean of the same 3 years.	No. of children who died under One, in every 1000. Mean of the same 3 years.	Percentage of children born who died under One. Mean of the same 3 years.
Nether Hallam...	1'15	30'4	40'6	6'9	16'9
Upper Hallam...	'06	18'9	34'6	3'1	9'0
Ecclesall Bierlow	2'28	27'8	38'1	6'3	16'5
Sheffield West, } North, South, } and Park ... }	6'69	26'8	40'1	8'5	21'6
Brightside	3'48	31'9	45'6	8'4	18'3
Attercliffe.....	2'88	32'8	50'0	8'7	17'4

By the third and last columns of Table VI., (and it is from these that the most reliable deductions can be drawn as to the comparative fatality to infant life occurring in the various townships,) we see that those townships remarkable for their heavy birth-rate are as a rule remarkable for the proportionate largeness of their infant mortality.

Causes of Infantile Mortality. When the percentages of the infantile mortality to the numbers of births registered, are compared with the number of houses to the acre in the different townships of Sheffield we find *that the infant mortality is directly proportioned to the number of houses to the acre.* The parallel between the two is too striking to ignore, and the numbers of births, deaths, places, and years from which this result is obtained are too large to be looked upon as a mere coincidence. There is certainly a slight exception in the case of Nether Hallam, but the divergence is too insignificant to be worthy of notice. Overcrowding of houses may fairly then be looked upon as an accompaniment of an excessive infantile mortality. In some of those

districts where overcrowding prevails, not only are there more houses to the acre, but those houses are more irregularly distributed over the whole area of the township, groups of houses being most densely packed together in certain parts of the township, whilst in other parts there are large spaces which are unbuilt upon. If the same plan of building houses were to be allowed in the future that there has been in the past, our infant mortality would become enormous. I am glad to observe that although 27·22 per cent. of the children born died in the period 1862 to 1870 that during the last three years our average mortality has diminished to 18·7 per cent., this decrease is no doubt due to our improved system of laying out building land.

When houses are closely packed together, they are invariably occupied by a poor population, and a poor population taken *en masse* are more ignorant and less thrifty and intelligent than the average ; they may earn more money, but they do not know how to spend it properly. They marry young and know less concerning the rearing of children than do their more provident townspeople.

The main causes of death in children are diarrhoea and other diseases dependent upon the administration of artificial and improper food ; and diseases of the respiratory organs, brought on by exposure to cold.

The great secret of rearing children healthily is to give them "plenty of sleep—plenty of *milk*—and plenty of flannel."

Although nature has most plainly indicated that the breast furnishes the natural food of the child, our Sheffield mothers, in many cases because they are employed away from home during the day, do not suckle their offspring, and to make bad worse, instead of rearing it on milk, they feed it with all kinds of farinaceous preparations, (patent foods) which are nearly as little capable of being converted into blood by an infant, as so much saw-dust would be. This food soon begins to irritate the bowels of the child ; it has diarrhoea, and wastes away. Whilst it is passing through this painful curriculum of suffering, which is neither more or less than a process of slow-starvation, it is probably dosed

with opium to still its cry of pain and hunger, for this drug is sold to the mothers of our courts, lanes, and alleys, in enormous quantities by the chemists, under the various forms of Infant's-Mixture, Infant's-Cordial, Soothing-Syrup, etc.

Those who feed their children on milk put too much water with it. Cow's-milk when *pure* requires about one-quarter of the quantity of water adding, and a little sugar, in order to render it similar in composition to the natural milk of the parent of the child. But the milkman has taken care to add often more than that before it came to the mother's hands ; and so, although water is looked upon as a harmless adulteration, it is an exceedingly injurious one in this case. Then again sufficient care is not exercised in the keeping sweet and clean of the vessels in which the milk is put ; and it is so rendered unfit for food by the impurities inducing in it incipient decomposition ; this decomposition is also induced by the addition of water, which has been exposed to the emanations existing in ill-ventilated rooms from the viscera both of sick and healthy persons, for water is most greedy in absorbing these impurities, and this decomposition is further caused by electricity. In the years 1870, 1871, and 1872, the deaths from diarrhoea, (which is principally an infantile disease when fatal results ensue,) were 507, 547, and 472 respectively. In the two former years my readers will remember that Sheffield had not a constant water-supply, and that 1872 has been remarkable for the amount of thunder which we have had. The storing of water by the poor in 1870 and 1871 in vessels totally unfit for any such purposes, and thereby allowing the water to become fouled, and subsequently to set up the baneful action above alluded to in the milk, was no doubt one of the causes which operated in affecting the heavy mortality of those years. Now if the people could be induced to put as much sulphite (not sulphate) of soda to the milk, as would not cost them above three-pence a year, it would prevent decomposition by all the causes above alluded to. The addition of this salt in the proportion required is both tasteless and non-injurious, and next summer I intend bringing its uses fully before the public.

It is because artificial feeding produces such an important increase in the number of infantile deaths, that I have not calculated the mortality of the four divisions of Sheffield separately in Table VI., for the mothers of these divisions are employed away from home in a greater proportion than any other of the townships mentioned.

Infantile Deaths from Diseases of the Respiratory Organs.
The number of deaths from the above causes ranks next in importance to those just treated of. Parents are not sufficiently careful in preventing the exposure of their young children to cold : they look upon them too much as grown instead of growing plants. A child is but a tender seedling, and we know how susceptible seedlings are to cold. The parents allege that this exposure *hardens* them ; a fallacy I suppose which has sprung up from their observation having taught them that those who have grown up after this process of hardening have been very sturdy and robust. Their very robustness of constitution has been the cause of their having passed safely through the ordeal, rather than the effect. The weakly ones succumb to the hardening process, but as they die they are forgotten, when judging of the merits of the experiment. Not only do parents have children out in their arms during all hours and the most unseasonable weather, but they send them out in perambulators for hours together. Now it may readily be conceived that instead of a child being out a longer time when not carried in arms, it should be out a much shorter interval, for in that case it is not kept warm by the heat imparted from the body of its nurse.

Lastly, I would urge upon parents a larger use of flannel in a climate so variable as ours, for it is such an excellent non-conductor of heat, that it keeps the surface of the body at a more equable temperature than cotton.

CONSTANT WATER SUPPLY.

A tradesman without capital, a mechanic without tools, etc. a manufacturer without material, are each as certain of success as a sanitary authority without an adequate and good water supply.

Without water *ad libitum* a town is dirty, its streets are dirty, and the residents thereof are dirty, both in their habits and houses, for the power of example and association are as potent in forming habits of uncleanness as they are any other custom.

If a dirty woman move into a clean neighbourhood, there is soon a marked improvement in the trouble she takes to give her house a decent appearance. I judge it to be the duty of every sanitary authority which has at heart the welfare of the community over which it presides, to take advantage of this tendency to imitate, in order to cultivate in the people those practices which while they raise their moral tone, diminish their mortality. But how shall the sanitary authority be liberal with water unless the control of it is entrusted to them ?

It is not within the province of a work like the present to enter fully into all the merits and the demerits of the water supply of a town like Sheffield being in the hands of the Corporation, but were I to fail in bringing before my readers, the advantages which would ensue from such possession, by the more efficient steps for the prevention of disease, which it would then be in the power of the Health Committee to take, I feel I should be shirk-

ing a responsibility which an enquiry like the present renders incumbent upon me to discharge.

Influence of a Constant Water Supply on the Diarrhœa Mortality in the Summer Months. When treating of the deaths from diarrhœa in the years 1870, 1871, and 1872, I made the statement that over 200 lives were lost in the September quarter of 1870, which would have been saved had they lived elsewhere, and after pointing out some reasons for this excessive mortality, I said I would defer the further consideration of the subject until I came to the question of a constant water-supply.

Now by a constant water-supply not only more water finds its way into the sewers, and so flushes them more efficiently, but by a constant water-supply the residents of a town have greater facilities placed at their disposal for keeping the surroundings of their habitations as well as the interiors of their homes sweet and clean.

During the autumns of 1870 and 1871, it will be remembered that Sheffield was stinted with water, while in 1872 we have had a constant supply, so during the two former years we might reasonably expect to have a greater diarrhœa mortality than in the last one. By referring to Table No. 7, below, it will be seen that such was actually the case.

TABLE VII. *Shows how beneficially a Constant Water Supply acts in checking Diarrhœa.*

	Rate per 1000 per annum who died from Diarrhœa.	Nature of Water Supply.	Efficiency of Scavenging Arrangements.	Rainfall in inches taken at Broomhall Park, by Daniel Don- caster, Esq., Jun.			
				July	Aug.	Sept.	Total.
1870...	7·0	Intermittent	Fair	·97	·86	1·63	3·46
1871...	7·3	do.	Inadequate	3·08	1·65	6·40	11·13
1872...	5·9	Constant	Ditto, but much improved	6·34	2·55	3·84	12·73

In 1870 we cannot fail to be struck with the calamitous consequences which ensue when an intermittent water-supply co-operates with a limited rain-fall to reduce cleansing operations to a minimum.

Now the best way in which an inadequate supply of water by artificial means can be partially compensated for, is by a copious rainfall. We see from the table how efficaciously a heavy rainfall and a constant water supply acted in 1872, but the figures even then do not come out in nearly so striking a manner as they would have done had the scavengering department been able fully to overtake the work which had fallen into arrears. In 1871, we see the fatal results which ensue when an intermittent supply is coincident with inadequate scavengering, for although we had a tolerably large rain-fall we still have a high rate of mortality; rain, although exceedingly beneficial to the surroundings of a house, cannot exert its influence in cleansing the interior.

In the chapter on Infantile Mortality I mentioned that it was largely influenced by the improper storage of water by the poor, when the supply was intermittent. In the autumn of 1870, I was first impressed with the views which I have stated above although I had not then the experience which I have gained from the mortality in 1872 to guide to those conclusions. On the 13th of August of that year, the following letter appeared in the Telegraph:

THE DEATH RATE IN SHEFFIELD.

TO THE EDITOR OF THE SHEFFIELD DAILY TELEGRAPH.

"SIR,—Sheffield has at length been aroused from its lethargic condition. The *ennui* attendant upon its being Sheffield near Rotherham has been too much for it, and, weary of oblivion, it steps boldly to the front, and the Registrar-General allows it to be pre-eminent amongst the seventeen large towns for deaths from diarrhœa.

"How is this priority to be accounted for? The continued hot weather and the consumption of fruit cannot be deemed the causes of this local excessive death-rate, for the weather has not been hotter or the fruit worse than that of other towns.

"Whilst London has only 6·2, and Sunderland 3·5, as its number of deaths per annum in every thousand, Sheffield has a rate as high as 11·2; and when it is remembered that our population is computed by the above authority at 240,000, it would appear that above a score lives a week are lost in Sheffield which are being saved in London.

"I consider that the following two (amongst others) may be looked upon as the causes of this state of things: 1st. The Water Company, until lately, have given the town a most irregular supply; that irregularity obliged consumers who were unprovided with cisterns to store a large quantity; this stored water amongst the poor must of necessity stand in vessels totally unadapted by their construction and previous uses for this purpose, and exposed to all the noisome and pestilential gases and germs emanating from over-crowded and filthy households, dirty courts, and decaying animal matter. These doses of disease being greedily absorbed by the already stale water, are conveyed into the system in that liquid which once was the pure rain of heaven.

"2nd. Owing to the scarcity of water again, and the absence of rain, the drains are inadequately flushed. The Water Company ought to have such a supply of water that persons in times of drought should be desired to be wasteful of water instead of careful, in order that the drainage of the town might be kept in good condition. Until the sewers are properly flushed, the people of Sheffield may always expect a heavy list of deaths from the cause above alluded to in a dry season.

"Believe me to be,

"Yours truly,

"JOHN TAYLOR, SURGEON."

But it may be said that in a dry season such as 1870, the company had not the water at their disposal, and therefore it was impossible for them to give such a supply as they are able to in a more humid one. To this I demur, for they could have given the town ample if they had cared to compensate the millowners and so have utilized the water which was running to waste comparatively speaking. The question was merely one of £ s. d., but as they get paid the same for it, whether they give a constant supply or whether they do not, of course they are not anxious to lessen their dividend by handing money over to the millowners, and this state of things existed although it was by their own fault, failure, and malfeasance in not carrying out the arrangements into which they had entered, to give the town a constant supply by that time.

Would not the Town Council have compensated the millowners and used the water, had the works been in the hands of the Corporation? Would not the human life thus saved have been of more value than their salvation would have cost?

Influence of a Constant Water Supply on the Fever Mortality Rates during the Summer Months. I have already shown at pages 5 and 14 that the number of deaths from fever is more dependent upon the perfection of our sewer arrangements than upon any other cause, and so here the value of a constant water-supply and copious rain-fall ought to be clearly brought out if there is any real connection between the mortality from fever and a supply of water to flush the sewers perfectly in the summer months.

In the case of diarrhoea we took the rain-fall which occurred in the months of July, August, and September, as the standard of comparison in the different years, or in other words, the rain-fall of those months during which the deaths from diarrhoea occurred; and for this reason, the poison which brings on diarrhoea acts at once, and the result if fatal is so speedily; but in the case of fever we should err if we took the rain-fall of these months as our basis of calculation, for not only do the disease germs which induce fever lay hidden in the system for some time, but the fatal termination does not occur so quickly.

From my own experience and after consulting the most eminent authorities on this subject, I have been able to fix the average period during which a patient survives, (if the case has a fatal termination,) at one month from the day of infection, so in judging of the value of rain-fall in lessening the mortality from fever in the months of July, August, and September, it is necessary to know the amount of rain which fell in the months of June, July, and August.

TABLE VIII. *Shows the Number of Deaths which occurred in the various Registration Sub-Districts of Sheffield; The Rainfall and the Water Supply in the years 1870, 1871, and 1872.*

Registration Sub-Districts.	DEATHS from FEVER in Quarter Ending September			Total.
	1870	1871	1872	
Nether Hallam	4	2	2	8
Upper Hallam	0	0	0	0
Ecclesall Bierlow, with Workhouse	33	10	7	50
Sheffield West.....	14	5	7	26
Sheffield North, with Work- house	27	10	10	47
Sheffield South	6	2	1	9
Sheffield Park	6	6	5	17
Brightside	28	6	6	40
Attercliffe	5	2	4	11
	<hr/>	<hr/>	<hr/>	<hr/>
TOTAL	123	43	42	
Rainfall in Inches during				
June, July, & Aug.				
of 1870-71-72, fur-				
nished by Daniel				
Doncaster, Esq. jun.)				
	3'10	9'36	13'45	

Nature of Water Supply...	Inter- mittent	Inter- mittent	Con- stant
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The facts in Table VIII. point mainly to one conclusion, viz. : that water and fever are as opposed as water and fire. We should call out most loudly if the Water Company were to withhold water which would save property from destruction, but when they withhold it and so cause a large loss of human life, we submit comparatively tamely. The mistake of ever trusting

a commercial body with one of the first necessities of life, has only been equalled by the apathy of the public in allowing its control to continue in other hands than their own. Dr. Simon's evidence before the Royal Commission on Water Supply, 1869, is very much to the point, he says : "This power of life and death in commercial hands is something for which, until recently, there has been no precedent in the world, and even yet the public seems but slightly awake to its importance."

When giving evidence before the above commission, those gentlemen who stand highest in their knowledge of those laws on which public health depends, were unanimous on the merits of a constant supply as contrasted with an intermittent one, and the commissioners in summing up the evidence say, "We are of opinion that the mode of distribution is a most important point, particularly as bearing on the health and comfort of the poorer classes, and we agree with the conclusions arrived at on previous inquiries, that earnest and prompt measures ought to be made to introduce the constant service system to the farthest extent possible ;" and further, in dwelling on the advantages of constant supply they say, "It allows the water to be drawn always fresh from the main free from the pollution often acquired in dirty receptacles, (*an evil of great magnitude amongst the poorer classes.*)"

The commissioners also report that Mr. Hawksley agrees that the poor ought to have an abundant and constant water-supply. Yet in the face of the expressions of their own Chief Engineer, the Sheffield Company are not yet prepared to give us a constant supply unless it rains about every other day in the summer, although in their Act of 1853, it was stipulated they should do so by 1863, but I am afraid unless we have another wet summer we shall not have it in 1873.

The New Water-Closet Arrangements. Although I think it right that an occupier should not be allowed to waste water recklessly, I must enter my protest against the present service of water to the above conveniences by means of what is known as

the "boot" reservoir, when the boot is of so small a capacity as that allowed by the New Regulations of the Water Company. But as all my readers may not perhaps understand the construction of the above apparatus, I will just explain that a four gallon cistern is divided by a boot, one compartment communicates with the discharge pipe, the other with the main, and the valves are so arranged that the discharging compartment does not communicate with the other one, so long as the water is descending to flush the pan, hence the quantity of water which is discharged cannot exceed 2 gallons, unless the distasteful duty of waiting until the second compartment again fills is gone through. Strange to say, when the regulations were before the magistrates the word of the Water Company's witnesses appears to have been allowed to pass unquestioned on the subject of this quantity being sufficient. I find that two gallons is totally inadequate for the efficient carrying away of the pan's contents, and I know that my own experience is borne out by that of others in the town, whom the Company have compelled to adopt the new system.

Dr. Parkes, Professor of Military Hygiene in the Army Medical School, in alluding to this subject, says even two gallons are often insufficient to keep the pan perfectly clean, the water waste preventer must be sometimes allowed to fill again, and be again emptied.

The Number of Gallons which should be allowed per head.
The difference in the amounts used daily per head in different towns is very great, because the circumstances of each town vary so considerably. Some towns even lose by leakage more than is employed legitimately, and again others use immense quantities for manufactures, steam engines, etc.

Dr. Parkes has made many experiments on this subject, and he found the amount *actually* used by a fairly clean man in a fairly clean household to be 12 gallons per day. The subjoined quantities are what he considers should be allowed per head :

Domestic Supply, without Baths or Closets.....	12	Gallons.
Add for General Baths	4	„
Water Closets.....	6	„
Unavoidable Waste	3	„
Town and Trade Purposes, Anima's, etc.	5	„
Add for Exceptional Manufacturing Towns ...	5	„
<hr/>		
TOTAL	35	„

Now when we remember that the amount of water used per head in Sheffield is only twenty gallons, that Sheffield uses immense quantities for trade purposes, and that the Water Company allege that the waste of water is very excessive, we have no difficulty in arriving at the conclusion that Sheffield is very badly treated in this matter, and that here we can lay our hands upon one of the main causes of the excessive mortality which prevails in the Borough.



THE TRADES OF SHEFFIELD INJURIOUS TO LIFE.

Certain of the Sheffield trades are rendered injurious to life through the introduction of metallic and non-metallic substances into the human body which are foreign to its composition, and inimical to the healthy performance of the various functions of its organs. In others, the functional activity of the organs is diminished, owing to the positions or postures which the artizan occupies whilst pursuing his calling. A third class of trades are detrimental to health through the great changes of temperature to which the workmen are exposed, sometimes unavoidably, at others through carelessness. I have the returns of deaths of the workmen of our principal trades before me for seven years, and I shall (together with my own experience) found the following remarks upon them.

File Cutting. The process of file-cutting is injurious to some of the employees who are engaged thereat by reason of the introduction of fine particles of lead into the system ; the file is cut whilst resting on a bed of lead, and the fine particles of that metal float in the air, but this is not by any means the principal way in which it is absorbed by the file-cutter, for it is largely conveyed to the mouth by the licking of the thumb and finger with which they hold the little chisel, by the continual striking of which the grooves of a file are made ; lead is also thought to be absorbed by the skin immediately underlying the overhanging portion of the nail, but I am inclined to think that this is a very minor mode of its introduction, for an empty space does not very

frequently exist under the nails of persons of the file-cutting class, being generally pre-occupied by other material than lead. Persons who have once become poisoned by lead are more susceptible of its influence in the future than they have been in the past, for it appears to be impossible to remove it wholly from the system. I remember once having a patient who was employed in the cutting of files, who had several attacks of lead colic, and I advised that he should discontinue the trade; he left off cutting, but entered the warehouse of the firm with whom he was a servant, in the new capacity of an examiner of the workmanship of others, but I found that the small quantity of lead which adhered to the files passing through his hands, was still sufficient to light up the old mischief, and he had to leave the trade altogether.

All persons who follow this trade are not, in my experience, alike susceptible to the baneful effects of lead, and this relative susceptibility is characteristic of many other poisons besides the one in question, *e.g.*, mercury, arsenic, and iodine produce very different results upon different people. If a workman is peculiarly susceptible to lead-poisoning the only safe course for him to adopt is to leave the trade altogether.

When I first inspected the process of file-cutting, and witnessed the manner in which some of the cutters poison themselves by licking the finger and thumb, I invented a simple little apparatus by which the danger arising from this course might be avoided. The following is a brief description of it: There was a syphon bottle with a projecting cup at the bottom, the whole somewhat resembling in appearance the fountain used for cage-birds and poultry, but the diameter of the top of the projecting cup was less than its middle diameter; the cup contained a sponge which was made to fit tightly within it, and rendered incapable of slipping away from the fingers when lightly pressed upon it, by taking care to choose one sufficiently large: and the bottle itself was filled with a strong solution of carbonate of soda.

The intention of the apparatus was that the moist sponge should take up the duties now performed by the tongue, and the carbonate of soda would also tend to form the lead into a carbonate of lead, a salt which is, comparatively speaking, unabsorbable. It is owing principally to the carbonates which mineral water contain that we are enabled to store them with impunity in leaden cisterns and allow them to pass through leaden pipes, for an insoluble crust of carbonate of lead is formed within them which prevents the further action of the water upon the metal. But alas for human hopes and expectations ! when I endeavoured to bring this apparatus into use, I was told by the workmen that nobody need be poisoned by lead unless they liked, for it was principally owing to habits of uncleanness that certain members of the trade suffered so much, and that if they would not trouble to wash themselves, neither would they trouble to use my invention. I felt these reasons to be very cogent ones, and have since allowed the matter to rest.

I find that 376 file cutters have died in seven years, at an average age of 46, and that only an inconsiderable proportion of these deaths were due to the *direct* action of lead, but of course it is impossible to say how much many of them had suffered from the various forms of lead-poisoning during their life-time.

During the same period 58 file-hardeners have died at an average age of 47. This early mortality of the file-hardeners is not so much due to the injurious consequences of their trade as to the fact that about one-fourth have previously been file-cutters, who have been compelled to leave cutting and follow some other branch of the trade, and of course having been poisoned by lead their constitutions were thoroughly undermined.

Seventy-nine file-smiths attained an average age of 55, which is a very fair term of life.

GRINDERS AND THEIR DISEASES.

Grinders are divided into three classes, dry, mixed, and wet. This division hitherto has been of immense service in one way, viz., by drawing attention to the certainty of an early death which awaited all dry grinders, who did not use a fan to carry away the dust engendered by the process, for the term of life of the dry grinders has been considerably prolonged by the use of this valuable machine. I am sorry to say that my statistics only extend from the years 1864 to 1870 inclusive, but during the last three of these years (and I know of no causes which could act contrarily in 1871 and 1872) the average age at death of the dry and mixed grinders exceeds that attained by those employed upon the 'wet' stone. Hence, whilst the condition of the fork, razor, and scissor grinder has been most materially ameliorated, that of the grinders of edge tools, pen and pocket blades, and files, has not improved in the least; for in the years 1868, 1869, and 1870, the following were the numbers of each trade who died, and the average age at death :

Trades	No. of Deaths	Average Age at Death
Fork Grinders - - -	15	50
Scissor do. - - -	38	45
Razor do. - - -	23	45
Edge Tool do. - - -	17	39
Pen and Pocket Blade do. -	33	42
File do. - - - -	23	43

Not many years since the fork-grinders were considered to be old men when they attained the age of 35 or 40, but now the *average age at death is 50* ; so their expectation of life, (for the ages of those still alive must be considered also,) has been increased by 20 years. And why? because they have the best fans, and do not satisfy themselves with *having* them merely but *use* them.

From 1864 to 1870 inclusive, 630 grinders of all classes died at an average age of 44 years, and if we turn our attention for a moment to the diseases which caused these deaths, we see that they are in a great measure induced by the habits of the operatives themselves. The grinders of heavy goods work very lightly clad, and when perspiring are not at all careful to avoid suddenly cooling the skin, whilst it is actively engaged in discharging one of its principal functions, and thus they cause a sudden congestion of some of the internal organs of the body. The wet grinders, from not being sufficiently careful about their clothes being as dry as the nature of their avocation permits, and from wearing them unnecessarily whilst wet, are very subject to rheumatic fever, which malady in running its course very frequently leaves the heart diseased, so that if they come safely through the fever itself, they subsequently perish from its effects. Large numbers also succumb to the diseases induced by partaking too largely of alcohol in its various forms. Those also who are termed 'wet' grinders it must be remembered, are at times subjected to the injurious effects of dust, when engaged in 'hanging' and 'racing' the stone, and in polishing the better classes of goods. These effects might be entirely obviated if the workmen during the operation wore a respirator, which fitted over both the mouth and the nose, and having in its interior a thin layer of cotton wool, which *filters* all the air previous to its entrance into the lungs. Respirators of the foregoing construction are worn by the workmen of snuff-manufactories, and are found to be very efficient, and as they are inexpensive, I most cordially advocate their more general adoption.

Out of the 630 grinders of all classes who have died in seven years, I find 405, or 64 per cent., have succumbed to diseases of the respiratory organs. Now I have compared this mortality from diseases of the respiratory organs which occurred to the grinders, with the mortality from the same causes suffered by the rest of the population of Sheffield during the same period, and I find that while in the one case 64 per cent. died from diseases of this class, only 21 of the other did, although the smaller number includes the deaths of infants as well, and in the chapter on Infant Mortality I showed how largely infant life was lost through their being subjected to respiratory diseases.

If any one will look over the causes of death which operated in the cases of grinders during any lengthened period, he cannot fail to be struck by the frequent recurrence of the names of some three or four diseases ; or in other words, they are *killed off* by the diseases consequent upon the peculiarities of their trades, and the customs and habits of the various branches of those trades.

Before concluding these remarks on the influence of the mortality of special trades upon the general death-rate of the borough, I desire to draw the attention of my readers to the increase of disease prevailing among the 'hafters' of table and butcher's knives. This increase has been caused by the more general introduction of steam power during late years to perform those processes which formerly were done entirely by hand.

Causes of dust in Table Knife Hafting. The 'scale,' or that part of the handle which is usually of bone, is rendered 'octagon' by 'mousing' the side squares, and tops, on a 'glazer,' the glazer is a disc of wood fixed on a revolving axle, and as a wheel is encircled by a tire of iron, so is this disc with leather, and this leather is again covered with a mixture of emery and glue, and subsequently rubbed over with emery cake. Formerly the superfluous portions of the 'scale' were filed away by hand, but by the more modern process, they are more quickly made to disappear

in the form of fine dust, by pressing them against the rapidly revolving 'glazer,' and this is called, 'mousing.'

Not only does this powder consist of bone, but fine particles of brass from the screws or rivets of the 'tops' (or sides of the handle), and emery dust from the glazer, all combine to render the occupation more injurious. Dust is also largely caused by 'hollowing' the 'scale' with the 'hollowing tool' to fit the 'bolster,' (or that part of the knife which is raised at the end of the blade.)

Butchers' knives, when the scales are of bone, more especially, are 'hafted' by means of a glazer. 'Hafting' is an analogous process to that of 'mousing' in the table knife departments. When the scales are of wood, they are rendered 'octagon' by means of a circular saw, and are subsequently 'finished', and the rivets and screws smoothed down to the level of the scale with a hand file. Next the back of the knife with the included tang, (or that portion of the back of a knife which is continuous with the blade,) is glazed on the glazer, and the 'tops' (or sides of the handle) are 'glazed' and 'buffed.' The buff is made of leather, which is oiled and covered with rottenstone; so like the process of glazing, in addition to the dust which comes from the article in course of manufacture, additional dust arises from the 'buff' itself.

'Sloping the bolster', or rubbing down the end of the scale nearest to the blade, may be done with a hand file, but it is frequently done by the aid of power, by means of the float, (a revolving file); when the bolster is sloped by power, it gives rise to a little dust, but as it is not very fine, so therefore it more quickly subsides.

Two questions naturally suggest themselves to us respecting the above processes. 1st.—Is there any other plan in which, while still employing power, the quantity and quality of dust might not be so hurtful to the workmen, &c.; and 2nd.—do the

workmen of these branches take adequate precautions to avoid the injurious consequences of dust, by means of fans, &c. ?

With regard to the process of mousing, I believe that the float (or circular file revolving by power) might be more extensively substituted for the glazer by the manufacturers than it is at present, for as the detached particles are comparatively large, they do not rise so easily ; in fact, there is as much difference between the effects of the two, as if in one case, flour were blown into the room, and in the other saw dust.

I find that the grinders in these branches of the Sheffield trade, are more careless of the consequences of dust than are any other class ; they will not keep their shops clean, but leave the dust to accumulate for weeks together, and the slightest movement causes clouds of it to arise. In many cases they might never have heard, there was such an instrument as a fan in existence for what use they make of it. I have at the present time under my care, a table knife hafter, and a butcher's knife hafter, both suffering from grinders' disease, who each work in shops where there are eight other hands, yet in neither is a fan employed. In one of the shops there are now two vacant places, one of which belongs to the patient under me, the other to a young man only twenty-three years of age, who is dying of grinder's disease, and some of the other inmates are occasionally away from work owing to the effect of dust. In the other shop, my patient informs me, that although none of the men except himself, are completely invalided as yet, still many of them lose a few days at a time, owing to their *coughs*. These '*coughs*' are the beginning of the end.





